Defining Optimal Clean Power Goals

Data-driven analysis for future-proofed clean energy purchases

verse

Introduction

Historically, corporate clean power adoption has been driven by a few innovative organizations with deep pockets and internal teams of experts. Their leadership has scaled clean energy deployment faster than many expected. According to the Clean Energy Buyers Association (CEBA), in 2022, corporate and institutional clean energy procurement accounted for "70% of the carbon-free energy capacity added to the grid."[1]

But buying clean power remains out of reach for many organizations due to the complexity of the buying process and the specialized expertise required. That prevents them from accessing the financial benefits of clean energy, which include the ability to hedge exposure to electricity price volatility, monetize customer willingness to pay for emissions reductions, and reduce exposure to regulatory changes.

To continue to scale clean energy adoption, we must make the switch to clean power easier, faster, and more affordable for more organizations. Most companies have limited experience with buying clean power. That means we must improve the entire process, starting with portfolio planning – also known as goal setting.

Portfolio planning involves helping companies understand different clean energy goals and the associated financial, risk, and carbon impacts of each. Without a holistic and ongoing analysis of possible goals, an organization could be exposed to financial volatility and stranded renewable assets[2]. Accurate, data-driven analysis of key factors such as cost, basis and shape risk, and emissions reductions is therefore crucial to building an optimal clean energy strategy and portfolio.

Recent and pending regulatory and voluntary framework changes are driving companies to procure clean power in more granular ways (e.g., with time- and location-based matching requirements). And the increasing complexity of electricity markets and technologies like energy storage surpass the analytical capabilities of legacy tools (humans and spreadsheets). Clean energy buyers will require the power of artificial intelligence (AI) to analyze potential scenarios and future-proof their clean power procurement.

That's why Verse™ leverages tools such as large language models, generative AI, and stochastic optimization in its proprietary software platform, Aria™. Aria provides customers with automated analysis of any number of clean power goals across market assumption sets. By understanding potential financial outcomes, risks, and asset mixes, customers can make better decisions about their clean energy goals and build optimal risk-aware portfolios of assets.

The following case study illustrates how Aria helped Heirloom identify the right clean energy goal for its business and, based on this goal, design its optimal clean power portfolio.

1 "Customer-driven clean energy procurement, not regulation, is driving decarbonization," by Kevin Hagen. Utility Dive, September 25, 2023. Link

2 Stranded renewable assets occur when an organization purchases clean power but the relevant regulatory frameworks do not allow for this clean power to count towards the organization's sustainability goals -- for example, because the power has been procured from a different electricity grid.

Determine the Optimal Clean Power Goal

Heirloom, a leading developer of direct air capture (DAC) carbon dioxide removal (CDR) technology, powers its facilities with 100% renewable energy to maximize its climate impact. That makes procuring clean energy for its operations and removing CO_2 from the air a crucial decision. The company, which was focused on building the first operational DAC plant in the U.S., wanted to evaluate procurement strategies and clean energy growth trajectories under different regulatory and performance criteria. So, it turned to Verse's Portfolio Planning app for assistance.

Before it entered any contracts, Heirloom needed to answer several fundamental questions about its clean energy goals, including:

Cost

What are our financial parameters for procuring clean energy?

Energy Consumption

Based on our expected energy consumption, what will achieving 100% renewable energy cost? How will our growing energy consumption over the coming years impact our strategy?

Location

How can we optimize our procurement strategy, knowing that we will only buy clean power in the same grid in which we operate?

Time

We can turn our operations on and off based on the availability of renewable power at different times of the day. How does this strategy change if we match clean energy on an annual, monthly, or hourly basis?

Emissions

What are our emissions goals? How much greenhouse gas emissions will our clean energy purchases displace?

The answers to these questions affect the cost of clean power procurement, the associated emissions reduction, and the long-term risk of stranded renewable assets. Furthermore, organizations like Heirloom – which is building large DAC facilities with decades-long lifespans and is committed to only buying additional clean energy in the grid in which it operates – are sensitive to regulatory changes that would alter the availability and cost of renewable power. It was critical for Heirloom to manage its long-term risk by identifying the right clean power goals.

Aria Crunches the Numbers

Heirloom used the Aria Portfolio Planning app to analyze nine possible clean power procurement goals. The company is committed to going beyond industry standard practice for renewable procurement by only procuring renewable energy in the same grids in which it operates (Scenarios 3-9 below). Scenarios 1 and 2 serve as baseline comparisons: The analyzed scenarios ranged from 100% RE with no location requirement to achieving the maximum possible carbon-free energy (CFE) score.

FIGURE 1. **Procurement Philosophies: Initial Analysis Results**

Key Inputs:

Load	Market price and emissions forecast	Emissions forecast methodology
Flat load (50% grid A / 50% grid B)	**Base scenario**	**Grid average**

Procurement philosophies modeled:

SCENARIO 1	100% RE unconstrained
SCENARIO 2	100% RE unconstrained + carbon matching
SCENARIO 3	100% RE by grid
SCENARIO 4	100% RE by grid + carbon matching
SCENARIO 5	100% RE unconstrained + 70% CFE
SCENARIO 6	100% RE unconstrained + 80% CFE
SCENARIO 7	100% RE unconstrained + 90% CFE
SCENARIO 8	100% RE + 90% CFE direct contracting (no credit for grid CFE)
SCENARIO 9	Max possible % CFE

Aria used advanced data science and mathematical optimization combined with pre-loaded, 20-year hourly market forecasts to evaluate the implications of the nine scenarios. It then automatically produced easy-to-read slides that Heirloom could present to its executive leadership team. The slides illustrated the optimal asset mix, costs, and emissions reduction for each goal.

Holistic Analysis of Goals and Asset Mixes

Thanks to Aria, Heirloom could compare, among other things, the incremental cost of clean energy procurement, the % RE, % CFE, and the annual emissions reduction associated with each goal. (Explanations of the goals are in the appendix.) Figure 2 shows analysis of four of the nine possible goals.

FIGURE 2. **Key Metrics by Scenario**

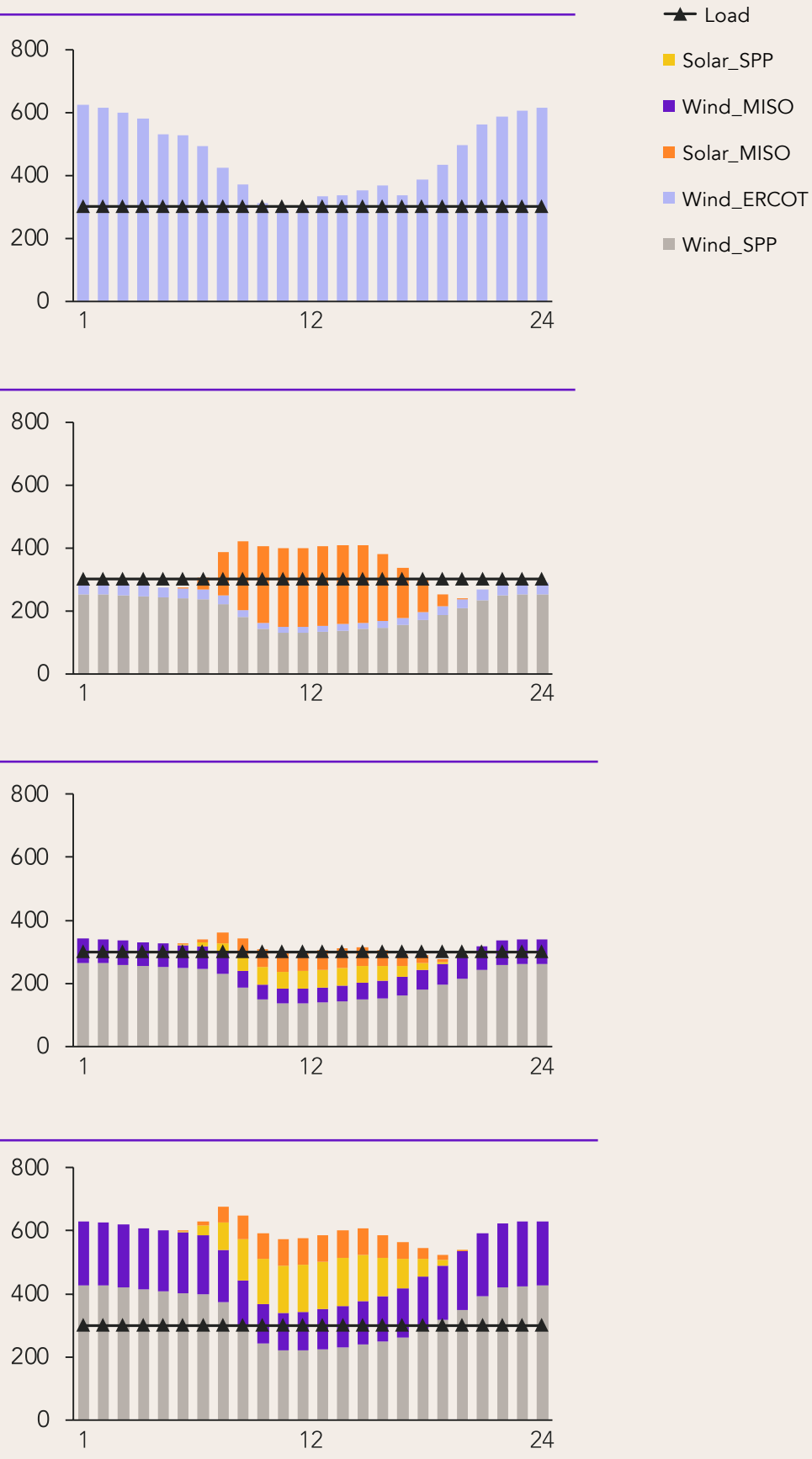
**Metrics shown are per year*

Scenario	Green Premium ($M, Levelized Cost)	Load Cost ($M)	Green Premium %	Implied REC Cost ($/MWh)	RE %	Load Annual Emissions (metric tons)	Annual Emissions Reduction (metric tons)	Contracted CFE %
RE Matching National + Emission	$10.1M	$101.6M	10%	$2.5	154%	0.87M	0.87M	0%
RE Matching Grid + Emission	$18.4M	$101.6M	18%	$6.39	109%	0.87M	0.87M	72%
Contracted CFE 90%	$24.3M	$101.6M	24%	$8.69	106%	0.87M	0.86M	90%
Contracted CFE Max	$51.6M	$101.6M	51%	$9.82	200%	0.87M	1.71M	100%

Aria also empowered Heirloom to understand the optimal asset mix to meet each goal, including the 100% RE baseline. For instance, Figure 3 shows that with a grid location constraint ("100% RE by grid + carbon matching"), the optimal asset mix is mostly wind power in SPP, solar in MISO, and wind in ERCOT.

FIGURE 3. **Hourly Average Generation by Scenario**

**Metrics shown are per year*

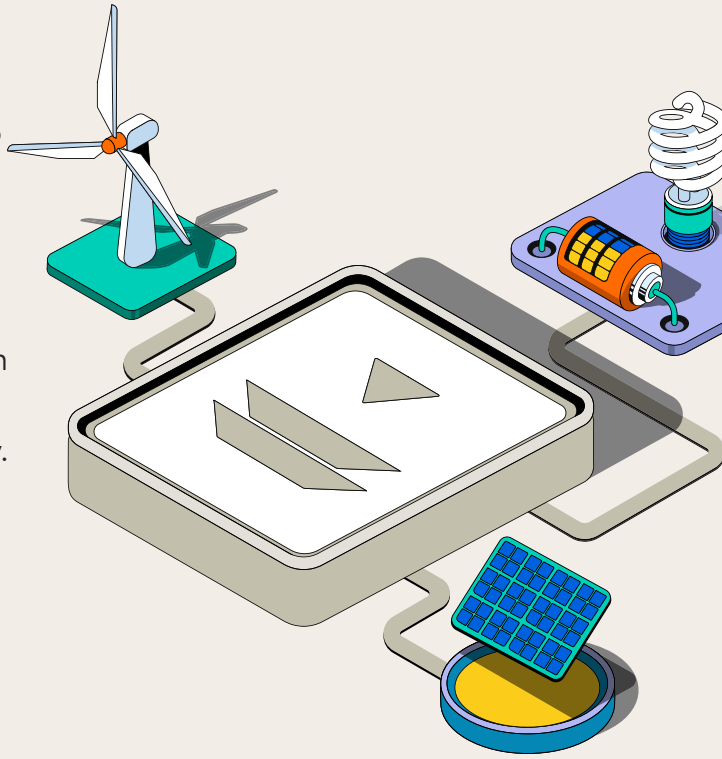


A Clear Path for Clean Power

Aria's insights empowered Heirloom to make an informed, data-driven decision about its clean energy goal and select a series of strategies that best met its emissions-reduction objectives while also meeting budget and risk requirements. Aria also identified the optimal future-proofed clean energy portfolio to achieve Heirloom's goal.

Importantly, although this case study focuses on initial goal setting analysis and portfolio planning for Heirloom, corporate clean power goals are not "one and done." Evolving markets, technologies, and regulations require continuous iteration and optimization. Advanced analytical tools like Aria enable dynamic optimization to ensure plans don't go stale and are based on the most up-to-date market information.

By defining its clean power goals, Heirloom was able to move forward with confidence in its clean power journey. Within a month of Aria's Portfolio Planning app analysis, Heirloom went to market with a request for offers (RFO) to source its clean power, confident that it could evaluate offers from electricity suppliers based on both the standalone economics of the offers as well as their compatibility with Heirloom's clean power strategy.



Take the Next Step in Decarbonization

Buying clean power can be daunting, especially for those unfamiliar with the process. Verse's software demystifies this complexity and helps organizations like Heirloom identify their optimal clean energy goal and plan a future-proofed portfolio of assets.

No matter where you are on your clean power journey, Aria empowers you to determine the right strategy for your business and provides an annual roadmap to achieve it.

If you're new to clean energy, Aria helps you

1. Define your organization's clean power goals (e.g., annual, hourly, or carbon-matching)
2. Understand the optimal path to achieve these objectives
3. Educate stakeholders on foundational concepts & market dynamics

If you already have a portfolio of clean power assets, Aria can:

1. Analyze financial risks associated with your existing portfolio
2. Assess the performance of your portfolio under potential future standards and regulatory regimes
3. Analyze the impact of new procurements on your portfolio key metrics, progress toward meeting sustainability goals, and financial risk

Drop us an email at demo@verse.inc to identify the right clean power goal for your organization.

Goal Definitions

*All figures are illustrative only.

100% RE unconstrained

Annual matching of Heirloom's load (the amount of energy it consumes in a year) with clean energy purchased in any electric grid.

E.g., If it consumes 100,000 MWh of energy in one year, Heirloom procures 100,000 MWh of renewable energy in that same year from anywhere in the U.S.

100% RE unconstrained + carbon matching

Same as above BUT also ensuring annual matching of carbon emissions from consumption with avoided emissions from new (or "additional") clean energy purchased in any electric grid.

E.g., If its load were to emit 10,000 tons of carbon in one year, Heirloom procures clean power assets anywhere in the U.S. that will offset 10,000 tons of carbon in that same year

100% RE by grid

Annual matching of Heirloom's load with clean energy purchased in the same electric grid.

E.g., If the company's operations are based in Texas (the ERCOT electric grid) and it consumes 100,000 MWh of energy in one year, it procures 100,000 MWh of clean energy in that same year from assets also located in ERCOT.

100% RE by grid + carbon matching

Same as above while also ensuring annual matching of carbon emissions from consumption with avoided emissions from new (or "additional") clean energy. The carbon-matching procurement can occur in any grid where it is cost-effective if meeting the 100% RE by grid requirement does not result in enough avoided emissions.

E.g., If the company's operations are based in ERCOT and its load were to emit 10,000 tons of carbon in one year, Heirloom procures clean power assets in ERCOT (or other markets, if necessary) that will offset 10,000 tons of carbon in that same year.

100% RE unconstrained + 70% CFE

Hourly matching of 70% of Heirloom's hourly load (the amount of energy it consumes every hour) with clean energy purchased in the same electric grid.

E.g., If the company uses 10 MWh in the hour between 10:00 and 11:00am on December 1st, 2023, it procured 7 MWh of clean power in that same hour. The company can take credit for residual/uncontracted carbon-free energy that happens to be in the electric grid in which it operates.

100% RE unconstrained + 80%/90% CFE

Hourly matching of 80%/90% of Heirloom's load with clean energy purchased in the same electric grid.

100% RE unconstrained + 90% CFE direct contracting (no credit for grid CFE)

Hourly matching of 90% of Heirloom's load with clean energy purchased directly from a clean energy resource in the same electric grid. In other words, the company cannot take credit for residual/uncontracted carbon-free energy that happens to be in the electric grid in which it operates.

Max possible % CFE

Hourly matching of the max possible amount of Heirloom's load with clean energy purchased in the same electric grid.